Extra Example 10.1

In a photography exhibit, 6 photographs will be displayed in a row along one wall. How many different ways can the photographs be displayed? How many different ways can 3 of the photographs receive first prize, second prize, and honorable mention? **720; 120**

10 CHAPTER REVIEW

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- Multi-Language Glossary
- Vocabulary practice

REVIEW KEY VOCABULARY

- permutation, *p. 684*
- factorial, *p. 684*
- combination, *p. 690*
- Pascal's triangle, *p. 692*
- binomial theorem, *p. 693*
- probability, *p. 698*
- theoretical probability, *p. 698*
- odds, *p. 699*
- experimental probability, *p. 700*
- geometric probability, *p. 701*
- compound event, *p. 707*
- overlapping events, *p. 707*
- disjoint or mutually exclusive events, *p. 707*
- independent events, *p. 717*
- dependent events, *p. 718*
- conditional probability, *p. 718*
- random variable, *p. 724*
- probability distribution, *p. 724*
- binomial distribution, *p. 725*
- binomial experiment, *p. 725*
- symmetric distribution, *p. 727*
- skewed distribution, *p. 727*

VOCABULARY EXERCISES

2. The probability of an event is the ratio of the number of ways the event can occur to the total number of outcomes, while the odds in favor of an event is the ratio of the number of ways the event can occur to the number of ways the event cannot occur.

1. Copy and complete: A(n) __?__ is a selection of r objects from a group of n objects where the order of the objects selected is not important. **combination**

2. **WRITING** *Explain* the difference between the probability of an event and the odds in favor of the event.

3. **WRITING** You randomly select 10 cards, one by one, from a standard deck of 52 cards without replacement. You record the number of diamonds you get. Is this a binomial experiment? *Explain.* **No; there are more than two outcomes for each card selection.**

4. **WRITING** Let event A be randomly selecting a green marble from a bag that contains red, green, and blue marbles. Let event B be randomly selecting a marble that is not red from the same bag. Are events A and B disjoint events? *Explain.* **No; the events have 1 outcome in common, selecting a green marble.**

REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of Chapter 10.

10.1 Apply the Counting Principle and Permutations *pp. 682–689*

EXAMPLE

An ice skating competition features 8 skaters. How many different ways can the skaters finish the competition? How many different ways can 3 of the skaters finish first, second, and third?

There are 8! ways the skaters can finish the competition.

$$8! = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 40{,}320$$

There are ${}_8P_3$ ways that 3 of the skaters can finish first, second, and third.

$${}_8P_3 = \frac{8!}{(8-3)!} = \frac{8!}{5!} = 336$$

@HomeTutor classzone.com Chapter Review Practice

EXAMPLES 4 and 5 on pp. 684–685 for Exs. 5–9

EXERCISES

5. **PHOTOGRAPHY** You are placing 12 pictures on separate pages in an album. How many different ways can you order the 12 pictures in the album? How many different ways can 4 of the 12 pictures be placed on the first 4 pages? **479,001,600 ways; 495 ways**

Find the number of permutations.

6. ${}_9P_1$ **9** **7.** ${}_5P_5$ **120** **8.** ${}_6P_3$ **120** **9.** ${}_{10}P_2$ **90**

10.2 Use Combinations and the Binomial Theorem *pp. 690–697*

EXAMPLE

Use the binomial theorem to expand $(x + 5y)^4$.

$$(x + 5y)^4 = {}_4C_0x^4(5y)^0 + {}_4C_1x^3(5y)^1 + {}_4C_2x^2(5y)^2 + {}_4C_3x^1(5y)^3 + {}_4C_4x^0(5y)^4$$
$$= (1)(x^4)(1) + (4)(x^3)(5y) + (6)(x^2)(25y^2) + (4)(x)(125y^3) + (1)(1)(625y^4)$$
$$= x^4 + 20x^3y + 150x^2y^2 + 500xy^3 + 625y^4$$

EXAMPLES 3, 5, and 6 on pp. 691–693 for Exs. 10–14

EXERCISES

Use the binomial theorem to write the binomial expansion. **10–13. See margin.**

10. $(t + 3)^6$ **11.** $(2a + b^2)^4$ **12.** $(w - 8v)^4$ **13.** $(r^3 - 4s)^5$

14. **ICE CREAM** An ice cream vendor sells 15 flavors of ice cream. You want to sample *at least* 4 of the flavors. How many different combinations of ice cream flavors can you sample? **32,192 combinations**

10.3 Define and Use Probability *pp. 698–704*

EXAMPLE

You roll a standard six-sided die. Find the probability of rolling a number less than 3.

Two outcomes correspond to rolling a number less than 3: rolling a 1 or 2.

$$P(\text{rolling less than 3}) = \frac{\text{Number of ways to roll less than 3}}{\text{Number of ways to roll the die}} = \frac{2}{6} = \frac{1}{3}$$

EXAMPLES 1 and 4 on pp. 698–700 for Exs. 15–19

EXERCISES

You have an equally likely chance of choosing any integer from 1 through 30. Find the probability of the given event.

15. An even number is chosen. $\frac{1}{2}$ **16.** A multiple of 5 is chosen. $\frac{1}{5}$

17. A factor of 60 is chosen. $\frac{11}{30}$ **18.** A prime number is chosen. $\frac{1}{3}$

19. **COMMUTING** Out of 250 work days, a commuter arrived at work on time 47 times on Mondays, 43 times on Tuesdays, 48 times on Wednesdays, 39 times on Thursdays, and 40 times on Fridays. For a randomly selected work day, what is the probability that the commuter arrived at work on time? **0.868**

Extra Example 10.2

Use the binomial theorem to expand $(x + 3y)^4$. $x^4 + 12x^3y + 54x^2y^2 + 108xy^3 + 81y^4$

Extra Example 10.3

You are going to draw a card from a standard deck of 52 cards. Find the probability of drawing a 4. $\frac{1}{13}$

10. $x^6 + 18x^5 + 135x^4 + 540x^3 + 1215x^2 + 1458x + 729$

11. $16a^4 + 32a^3b^2 + 24a^2b^4 + 8ab^6 + b^8$

12. $4096v^4 - 2048v^3w + 384v^2w^2 - 32vw^3 + w^4$

13. $r^{15} - 20r^{12}s + 160r^9s^2 - 640r^6s^3 + 1280r^3s^4 - 1024s^5$

Extra Example 10.4

Let A and B be events such that $P(A) = \frac{4}{5}$, $P(B) = \frac{3}{10}$, and $P(A \text{ and } B) = \frac{3}{25}$. Find $P(A \text{ or } B)$. **$\frac{49}{50}$**

Extra Example 10.5

Find the probability of selecting a 9 and then another 9 from a standard deck of 52 cards if (a) you replace the first card before selecting the second, and (b) you do not replace the first card. **$\frac{1}{169}$; $\frac{1}{221}$**

Extra Example 10.6

An exam has 20 true-false questions. If you randomly fill in an answer page, what is the probability of getting exactly 15 answers correct? **about 0.015**

10 CHAPTER REVIEW

10.4 Probabilities of Disjoint and Overlapping Events *pp. 707–713*

EXAMPLE

Let A and B be events such that $P(A) = \frac{2}{3}$, $P(B) = \frac{1}{2}$, and $P(A \text{ and } B) = \frac{1}{3}$. Find $P(A \text{ or } B)$.

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = \frac{2}{3} + \frac{1}{2} - \frac{1}{3} = \frac{5}{6}$$

EXERCISES

EXAMPLES 2 and 4 on pp. 708–709 for Exs. 20–22

Let A and B be events such that $P(A) = 0.32$, $P(B) = 0.48$, and $P(A \text{ and } B) = 0.12$. Find the indicated probability.

20. $P(A \text{ or } B)$ **0.68**

21. $P(\overline{A})$ **0.68**

22. $P(\overline{B})$ **0.52**

10.5 Probabilities of Independent and Dependent Events *pp. 717–723*

EXAMPLE

Find the probability of selecting a club and then another club from a standard deck of 52 cards if (a) you replace the first card before selecting the second, and (b) you do *not* replace the first card.

Let event A be "the first card is a club" and B be "the second card is a club."

a. $P(A \text{ and } B) = P(A) \cdot P(B) = \frac{13}{52} \cdot \frac{13}{52} = \frac{1}{16} = 0.0625$

b. $P(A \text{ and } B) = P(A) \cdot P(B|A) = \frac{13}{52} \cdot \frac{12}{51} = \frac{1}{17} \approx 0.0588$

EXERCISES

EXAMPLE 5 on p. 719 for Exs. 23–25

Find the probability of randomly selecting the given marbles from a bag of 5 red, 8 green, and 3 blue marbles if (a) you replace the first marble before drawing the second and (b) you do *not* replace the first marble.

23. red, then green **a.** $\frac{5}{32}$ **b.** $\frac{1}{6}$

24. blue, then red **a.** $\frac{15}{256}$ **b.** $\frac{1}{16}$

25. green, then green **a.** $\frac{1}{4}$ **b.** $\frac{7}{30}$

10.6 Construct and Interpret Binomial Distributions *pp. 724–730*

EXAMPLE

Find the probability of tossing a coin 12 times and getting exactly 4 heads.

$$P(k = 4) = {}_nC_k p^k(1 - p)^{n-k} = {}_{12}C_4(0.5)^4(1 - 0.5)^8 = 495(0.5)^4(0.5)^8 \approx 0.121$$

EXERCISES

EXAMPLE 3 on p. 726 for Exs. 26–29

Find the probability of tossing a coin 8 times and getting the given number of heads.

26. 6 **about 0.109**

27. 4 **about 0.273**

28. 7 **about 0.031**

29. 0 **about 0.0039**